

Two new rare species in the *Thelymitra venosa* complex (Orchidaceae) from south-eastern mainland Australia

Jeffrey A. Jeanes

Royal Botanic Gardens Melbourne, Birdwood Avenue, South Yarra, Victoria 3141, Australia;

e-mail: jeff.jeanes@rbg.vic.gov.au

Abstract

Two rare species, *Thelymitra alpicolo* Jeanes and *Thelymitra incurva* Jeanes, are described as new and illustrated. Their relationship with *Thelymitra cyanea* (Lindl.) Benth., *Thelymitra erosa* D.L.Jones and M.A.Clem. and *Thelymitra venoso* R.Br. is discussed and information on distribution, habitat, pollination biology, flowering time and conservation status is given for all five species. A key is also provided to distinguish the five species. The confusion arising from the incorrect application of names in the complex is discussed, including reference to the related New Zealand species *Thelymitra pulchello* Hook.f.

Keywords: sun orchids, taxonomy, diagnostic features

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Introduction

Thelymitra J.R. Forst. & G. Forst. is a complex genus of orchids consisting of more than 100 described species, several described natural hybrids and at least eight undescribed taxa. It is concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical north-eastern Australia, about 20 species occur in New Zealand (15 endemic) and a few species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

Members of the small *Thelymitra venosa* R.Br. complex share several morphological features that, in combination, distinguish them from all other members of the genus. The post-anther lobe of the column is rather short and only partially hoods the anther. The dorsal surface is irregularly rugulose and the distal margin is irregularly sinuate, sometimes with a central tooth. The lateral lobes of the column lack hair tufts, are smooth and flattened, sometimes twisted or coiled, with irregularly toothed, lobed or erose margins.

Taxonomic history and discussion

Historically there has been some confusion about the correct application of names and the interpretation of species within the *T. venosa* complex. At least some of this confusion has persisted until very recently and has revealed itself in the many floras and orchid books published during that time.

Brown (1810) described *T. venosa* from material he collected at Port Jackson in 1803. This species has several large, prominently veined flowers with a broadly obovate labellum and long, tightly coiled lateral lobes on the column. Lindley (1839–40) described *Macdonaldia cyanea* Lindl. from material collected by Gunn (collection number 938) at Circular Head Tasmania in 1837. This species is similar to *T. venosa* but has generally fewer, smaller flowers that have shorter, less obviously coiled lateral lobes. Bentham (1873) made the combination *Thelymitra cyanea* (Lindl.) Benth. and clearly distinguished this species from *T. venosa*. Rodway (1903) incorrectly attributed the name *T. venoso* to plants common in Tasmania

(probably *T. cyanea*) while attributing the name *T. cyanea* to another common Tasmanian species (undescribed at the time and later to become *Thelymitra erosa* D.L.Jones and M.A.Clem.) with erose lateral lobes on the column. This confusion of names was perpetuated by Rogers (1911) and Black (1922) when they attributed the name *T. venosa* to plants from South Australia and Ewart (1931) when he attributed the name *T. venosa* to plants from Victoria. Nicholls (1935) invalidly published the combination *T. venosa* var. *speciosa* Nicholls, a superfluous name for the large flowering taxon from the Sydney sandstone area, clearly Brown's *T. venosa*. Rupp (1939) published the combination *T. venosa* var. *magnifica* another superfluous name for the same taxon, and later (Rupp 1943) perpetuated his concepts. The taxonomic and nomenclatural confusion became further entrenched with the publication of the excellent colour paintings of William Nicholls and the accompanying text (see Nicholls 1951 and Nicholls 1969). Hatch (1952) created the combinations *T. venosa* var. *cedricsmithii* Hatch (= ?*T. cyanea*), *T. venosa* var. *cyanea* (Lindl.) Hatch (= *T. cyanea*) and *T. venosa* var. *typica* nom. illeg. (the autonym, correctly *T. venosa* var. *venosa*), the latter incorrectly applied by Hatch to the widespread taxon *T. cyanea* but possibly also encompassing *T. venosa*. Most Australian botanists did not follow Hatch's classification. The name *T. cyanea* was by this time linked firmly with taxa with erose lateral lobes in Tasmania (Rodway 1903), Victoria (Nicholls 1951) and later in New South Wales (Nash 1968). Following his study of the type specimens, Clements (1989) confirmed that *T. venosa* was more or less confined to the Sydney sandstone region. He also concluded that *T. cyanea* was the very common species from alpine, subalpine and lowland swamps of south-eastern Australia (including Tasmania) and New Zealand, and the plants from the Australian alps with erose lateral lobes were conspecific with the New Zealand *Thelymitra pulchella* Hook.f. However, Clements' treatment did not account for plants with erose lateral lobes from lowland areas of Victoria or from Tasmania. Jones (1988) used Clements' classification, but only attributed *T. pulchella* to New South Wales and New Zealand. Bernhardt (1993) followed Clements (1989), while Backhouse and Jeanes (1995) followed Clements (1989), but attributed *T. pulchella* to New South Wales, Victoria and Tasmania and also included an apparently undescribed taxon

from lowland areas of East Gippsland Victoria as *T. sp. aff. pulchella* (described herein as *Thelymitra incurva* Jeanes). Further study of the type specimens of *T. pulchella* (Jones and Clements 1998) revealed that this species is not present in Australia after all, but is endemic to New Zealand. This research also revealed that possibly three or more distinct taxa shelter under the name *T. pulchella* in New Zealand. Jones and Clements (1998) described the species from Tasmania with erose lateral lobes as *T. erosa* while alluding to the plants from highland areas of south-eastern Australia as possibly being conspecific. My research has shown these latter plants to be distinct and are herein described as *Thelymitra alpicola* Jeanes.

Explanation of the terminology used

The genus *Thelymitra* is unusual in the Orchidaceae in that the six perianth segments generally differ very little from each other in terms of size, shape and ornamentation. The labellum does not bear any hairs, calli, glands, ridges, lobes, teeth or fringes and is apparently not involved in pollination. Since the perianth is virtually actinomorphic and generally lacks characters by which to distinguish the species, traditionally the structure of the column has supplied most of these distinguishing characters. Over the years a terminology has evolved to describe the column structure in *Thelymitra*, but some of these terms are poorly understood and some have never been defined adequately. Below is an explanation of some of the terms commonly used in this paper; most have a traditional usage, although this has often not been well understood.

Column (gynostemium): The column is exposed in the centre of the flower, it lacks a free filament and style, is short and thick and broadly winged from below the stigma to the level of the anther or beyond. The apex is usually 3–5-lobed and is often ornamented with hairs, fringes, teeth, calli, glands, tubercles or lobes. In the *T. venosa* complex the apex of the column extends to just beyond the point of insertion of the anther and the lateral lobes into a short post-anther lobe.

Post-anther lobe (mid-lobe): This structure protrudes beyond the point of insertion of the anther and of the lateral lobes, and it is usually of a different colour to the rest of the column. It has a complex vascular supply always associated with that of the functional anther and may be regarded as an outgrowth of the filament. In

some species it is represented only by a short flap or a band of small calli crowded across the back of the anther. In most species it extends well beyond the anther with a free margin that may be plain, undulate, toothed, notched or variously ornamented with tubercles. At its maximum development it forms a fleshy, tubular hood that is variously open on the ventral side and overhangs and obscures the anther. In the *T. venosa* complex the post-anther lobe is poorly developed and only partially hoods the anther. The dorsal surface is irregularly rugulose and the distal margin often sinuate and thickened, sometimes with a central tooth.

Lateral lobes (column-arms or lateral staminodes): These two structures are inserted one on each side of the post-anther lobe and extend forward or upward and often converge. They are each supplied by a single unbranched vascular bundle and are thought to represent staminodes. They may be flat and ribbon-like, terete and finger-like, straight, curved, twisted spirally or bent sharply, and are usually ornamented with lobes, teeth, tubercles or hairs. In the *T. venosa* complex the lateral lobes are smooth and flattened, sometimes twisted or coiled, with irregularly toothed, lobed or erose margins.

Table 1. Taxonomic history of the *T. venosa* complex showing the names used by various authors for the five Australian taxa recognised in the current treatment.

Author	Name used				
Brawn (1810)	<i>T. venosa</i>	nane	nane	nane	nane
Lindley (1839–40)	<i>T. venosa</i>	<i>Macdanaldia cyanea</i>	nane	nane	nane
Lindley (1840)	<i>T. venosa</i>	<i>Macdanaldia cyanea</i>	nane	nane	nane
Haaker (1858)	<i>T. venosa</i>	<i>T. venosa</i>	nane	nane	nane
Reichenbach (1871)	<i>T. venosa</i>	nane	nane	nane	nane
Bentham (1873)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	nane	nane
Mueller (1882)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	nane	nane
Radway (1903)	nane	<i>T. venosa</i>	<i>T. cyanea</i>	nane	nane
Rupp (1943)	<i>T. venosa</i> var. <i>magnifica</i>	<i>T. venosa</i>	nane	nane	nane
Nichalls (1951)	<i>T. venosa</i> var. <i>magnifica</i>	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. cyanea</i>	<i>T. cyanea</i>
Willis (1962)	nane	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. cyanea</i>	<i>T. cyanea</i>
Nichalls (1969)	<i>T. venosa</i> var. <i>magnifica</i>	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. cyanea</i>	<i>T. cyanea</i>
Gray (1966 and 1971)	nane	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. cyanea</i>	<i>T. cyanea</i>
Curtis (1979)	nane	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. cyanea</i>	? <i>T. cyanea</i>
Janes (1988)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	<i>T. pulchella</i>	nane
Clements (1989)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	<i>T. pulchella</i>	nane
Bernhardt (1993)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	<i>T. pulchella</i>	nane
Weber and Entwisle (1994)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	<i>T. pulchella</i>	<i>T. pulchella</i>
Backhouse and Jeanes (1995)	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. pulchella</i> p.p. <i>T. sp. aff. pulchella</i> p.p.	<i>T. pulchella</i>	<i>T. sp. aff. pulchella</i>
Janes and Clements (1998)	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. erasa</i>	? <i>T. erasa</i>	<i>T. erasa</i>
Bishop (2000)	<i>T. venosa</i>	<i>T. cyanea</i>	nane	<i>T. pulchella</i>	nane
Jeanes and Backhouse (2000)	nane	<i>T. cyanea</i>	nane	<i>T. sp. aff. erasa</i>	<i>T. erasa</i>
Jeanes and Backhouse (2006)	nane	<i>T. cyanea</i>	nane	<i>T. erasa</i> subsp. 2	<i>T. erasa</i> subsp. 1
Janes (2006)	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. erasa</i>	<i>T. alpicala</i> (ined.)	<i>T. incurva</i> (ined.)
Jeanes (2012, this paper)	<i>T. venosa</i>	<i>T. cyanea</i>	<i>T. erasa</i>	<i>T. alpicala</i>	<i>T. incurva</i>

Auxiliary lobes (accessory lobes or side lobules):

Several species of *Thelymitra* have a pair of distinct lobes between the post-anther lobe and the lateral lobes. These have no vascular strand and are most accurately described as being part of a tripartite post-anther lobe. They tend to be fleshy with irregularly jagged margins and sometimes have small surface tubercles. In the *T. venosa* complex they are completely absent.

Anther: In *Thelymitra*, the anther is usually small, ovoid, and situated entirely between the column wings. The connective extends beyond the pollinia into an apical beak-like projection of varying size. The anther may be entirely above the stigma and variously obscured behind it. In the *T. venosa* complex the anther is inserted towards the apex of the column at anthesis. The dorsal surface is papillose and the anther beak is moderately large and may be entire or bifid at the apex.

Pollinia: Members of the genus *Thelymitra* contain four pollinia in two groups of two. In the *T. venosa* complex the pollen grains may be tightly bound with the pollinarium being removed by insects as a single unit (in *T. venoso*), or, more usually, the pollen is friable leading to autogamy.

Stigma: The stigma in *Thelymitra* is more or less bilobed at the apex, usually quadrate or transverse-elliptic in shape and located at the base of the column on a thick stalk.

Materials and methods

This paper is the result of a qualitative and quantitative study of the pertinent type material (or photographic reproductions thereof), all the available herbarium specimens (both dry and spirit-preserved) from AD, BM, BRI, CANB, E, HO, MEL, NSW, P, PERTH, QRS, SUNIV and WELT, and freshly collected specimens of all taxa except *T. venoso*, which were vouchered and deposited at the relevant herbaria. Orchid taxa in general, and *Thelymitra* taxa in particular, are much more readily identified from fresh living material where characters of the perianth, the column, flower colour and fragrance are still intact. Familiarity with the taxa gained from field study and the study of freshly collected specimens sent to me by field operatives has made the identification of dried and spirit-preserved herbarium material (including type specimens) much easier.

When collecting *Thelymitra* for study it is essential that

the entire above ground parts of the plant be taken, with the majority of the material being preserved in spirit. Plants preserved in the pressed state are often difficult to identify to species level in the absence of additional information. Spirit-preserved specimens on the other hand, are generally much more easily identified to species level. The observation of plants growing *in-situ* is the ideal method of study for *Thelymitra* in general, and often it is only by this method that cryptic new species can be identified. For this reason the importance of field work in the study of species complexes within *Thelymitra* cannot be overstated and should form an integral part of any future studies of the group or its individual members.

Taxonomy

1. *Thelymitra venosa* R.Br., *Prodr.* 314 (1810).

Type: Port Jackson; marshes towards Botany Bay, x.–xi.1803, R. Brown s.n. (lectotype 'a' BM!, fide Clements 1989; isolectotype BM!).

Macdonoldio venoso (R.Br.) Lindl., *Edwards's Bot. Reg.* appendix to vols 1–23 [Sketch Veg. Swan R.]: 50 (1839–40).

Thelymitra venosa R.Br. var. *speciosa* Nicholls, *Orchidol. Zeylanica* 2: 157 (1935), nom. inval.

Thelymitra venoso R.Br. var. *magnifica* Rupp, *Austrol. Orchid Rev.* 4: 81 (1939). Type: Wentworth Falls, xi.1916, H.M.R. Rupp s.n. (lectotype NSW! fide J.Z. Weber 1988 *in sched.*; isolectotype AD!); Syntypes: Laura, xi.1926, E. Stephen s.n. (AD!)

Illustrations: Bauer (1803) colour drawing; Nicholls (1969) plate 50, fig. a (as *T. venosa* var. *magnifica*); Bishop (2000) plate 49; Jones (2006) page 250.

Glabrous terrestrial herb. Tubers ovoid, 1.5–4 cm long, 5–15 mm wide, fleshy. Leaf linear, 10–30 cm long, 5–10 mm wide, erect, canaliculate, pale to dark green, ribbed abaxially, fleshy, sheathing at base, apex acute. Scope 25–70 cm tall, 1.5–3 mm diam., slender, wiry, pale green to purplish. Sterile bracts 1 or 2, rarely 3, linear-lanceolate, 1.8–4 cm long, 3–9 mm wide, closely sheathing, acute to shortly acuminate, green to purplish. Fertile bracts ovate-acuminate to obovate-acuminate, 5–20 mm long, 3–7 mm wide, sheathing the pedicels, green or purplish. Pedicels 8–16 mm long, slender. Ovary cylindrical to narrow-obovoid, 5–13 mm

Key to the Australian species in the *T. venosa* complex.

- 1 Labellum broadly obovate, different in shape from the other perianth segments; lateral lobes of column entire or lobed at apex, variously twisted; anther beak bifid at apex2
- 1: Labellum obovate to oblanceolate, not greatly different in shape from the other perianth segments; lateral lobes of column with margins variously erose; anther beak sometimes slightly emarginate, but not bifid at apex.....3
- 2 Flowers 35–50 mm across; lateral lobes of column twisted in a long, tight coil; New South Wales central coast and Blue Mountains..... 1. *T. venosa*
- 2: Flowers 25–30 mm across; lateral lobes of column twisted in a short open spiral; widespread in south-eastern Australia2. *T. cyanea*
- 3 Lateral lobes of column somewhat concave on the inner surface, often strongly incurved throughout, apices usually touching or overlapping; perianth pale blue (rarely pink) inside, lacking obvious darker striations; moist sandy sites often around the edges of grasstree plains5. *T. incurva*
- 3: Lateral lobes of column more or less flat, more or less parallel to weakly incurved, apices rarely touching; perianth mid-blue to purplish blue or pink inside with obvious darker striations; habitat not as above4
- 4 Perianth mid-blue to pale purplish or pink with variable darker longitudinal striations; lateral lobes of column often very broad at the base and deeply erose; Tasmania only, where widespread3. *T. erasa*
- 4: Perianth deep purplish blue with very strong darker longitudinal striations; lateral lobes of column often narrow at base and shallowly erose; mostly alpine and montane mainland south-eastern Australia4. *T. alpicala*

long, 1–4 mm wide. *Flowers* 1–8, 25–50 mm across, dark blue with darker blue longitudinal veins, particularly on the dorsal sepal and petals, rarely white or pink, opening freely even in cool weather and often remaining open at night. *Perianth segments* 12–25 mm long, 5–14 mm wide, thin textured, flat or slightly concave, sometimes recurved, often shortly apiculate; *dorsal sepal* ovate-lanceolate to ovate, obtuse or acute; *lateral sepals* ovate-lanceolate to ovate, often slightly asymmetric, more or less acute; *petals* ovate to obovate, obtuse or acute; *labellum* broadly obovate, broader than other perianth segments, distal margins often crisped, obtuse. *Column* erect from the end of ovary, 3–4.5 mm long, 2.5–3.5 mm wide, broadly winged, white to pale blue; *post-anther lobe* not hooding the anther, very short, covered with beady glands, cream; *auxiliary lobes* absent; *lateral lobes* more or less parallel, 2–3 mm long, 0.8–1.2 mm wide, flattened, obliquely erect, spirally twisted, yellow, apex entire. *Anther* inserted near apex of column, ovoid, 3–3.6 mm long, 1.8–2.7 mm wide, protruding forward at c. 90 deg. to column, white, dorsal surface minutely papillose, connective produced into a yellow bifid beak 1–1.5 mm long (branches 0.4–0.6 mm long); *pollinarium* 2–2.5 mm long; *viscidium* more or less circular, c. 0.5 mm diam.; *pollinia* coherent, white. *Stigma* situated near base of column, transversely elliptic, 1.5–2 mm long, 1.8–2.5

mm wide, concave, margins irregular. *Capsules* obovoid, 15–20 mm long, 5–9 mm wide, erect, ribbed. (Fig. 1a; 4a)

Selected specimens examined: NEW SOUTH WALES:

Leura, xi.1926, *H.M.R. Rupp s.n.* (MEL 625607, MEL 625361); Port Jackson District, xi.1896, (MEL 114441); Wentworth Falls, Blue Mountains, x.1948, *I. Bowden s.n.* (MEL 1532680); Blue Mountains, xii.1883, *R. Thorn s.n.* (MEL 1550454); Govett's Leap, Blue Mountains, 22.xi.1897, *G. Lyell s.n.* (MEL 573451); Central Tablelands: Mt Victoria, xii.1963, *W. Brinsleys s.n.* (CANB 8104537); Central Coast: East Kangaloon, 9.xi.1969, *B. Whitehead s.n.* (CANB 8104533); Undercliff Walk, Wentworth Falls, 2.xii.1990, *A.D. Bishop J130/6-8 and J.F. Keller* (NSW 274068); Mt Victoria, 7.xii.1890, *R.J.B. s.n.* (NSW 465641); Central Tablelands: c. 7 km SW of Katoomba, Narrowneck Peninsula, 24.i.1989, *D.L. Jones 3481 and G. Savage* (CANB 8901337); Medlow, Blue Mountains, xii.1906, *G.A. Wilson s.n.* (NSW 190381); Katoomba, 17.xii.1927, *G.V. Scammell s.n.* (NSW 190379); Upper Carrington Falls, 11.xii.1960, *E. and L.I. Cady s.n.* (NSW 182838); Leura, xi.1926, *E. Stephen s.n.* (MEL 114432, MEL 2045062, MEL 573527, NSW 190380, NSW 190382, AK 96346).

Distribution and habitat: Endemic to New South Wales, where confined to the Blue Mountains and nearby coastal areas. Grows on sandstone rock ledges among low shrubs, sedges and mosses in wet soils. Altitude: 10–1000 m. (Fig. 2a)

Conservation status: Rare and of very limited distribution. Suggest 2RC by criteria of Briggs and Leigh

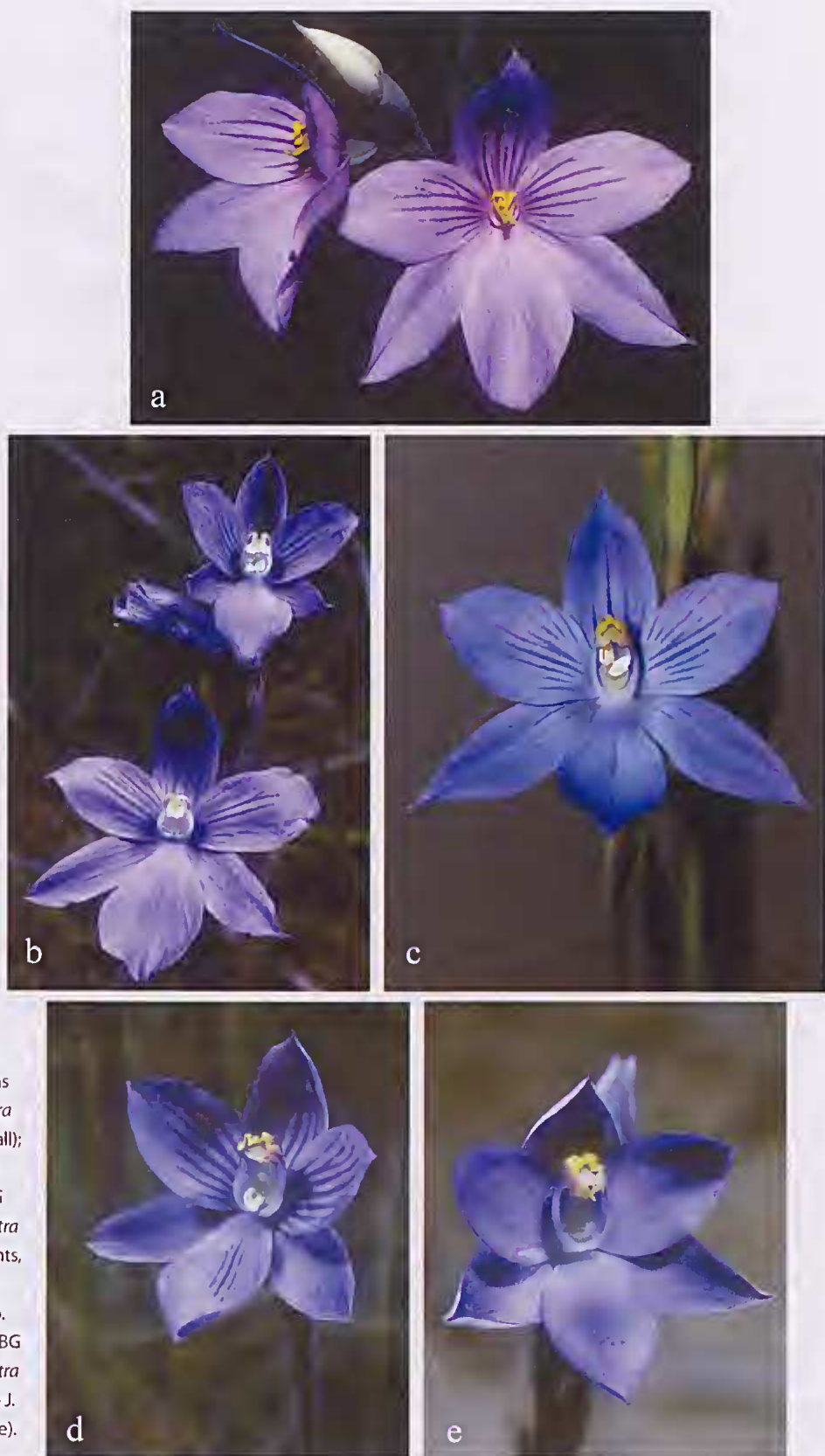


Figure 1. Photographs of species: a. *Thelymitra venosa* (photo R. Tunstall); b. *Thelymitra cyanea* (photo J. Jeanes, RBG Melbourne); c. *Thelymitra erosa* (photo M. Clements, CSIRO Canberra); d. *Thelymitra alpicola* sp. nov. (photo J. Jeanes, RBG Melbourne); e. *Thelymitra incurva* sp. nov. (photo J. Jeanes, RBG Melbourne).

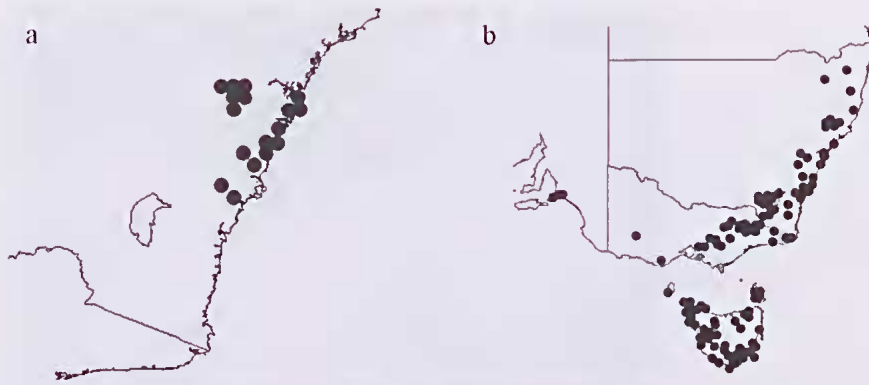


Figure 2. Distribution maps of: a. *Thelymitra venosa*; b. *Thelymitra cyanea*

(1996) and Near Threatened (NT) by criteria of IUCN (2011).

Flowering period: October to January.

Pollination biology: The large, easily opening flowers, functional viscidium and sporadic capsule production would suggest that this species is most likely entomophilous.

Typification: The type sheet contains five specimens from two different collections. The two specimens on the right appear to have been collected at Port Jackson in 1803 by Robert Brown and one of these (a) was selected by Clements (1989) as the lectotype. The three specimens on the left appear to be of the same taxon but were collected much later by Robert Fitzgerald.

Notes: *Thelymitra venosa* is closely related to *T. cyanea* (mostly from high altitude parts of south-eastern Australia and New Zealand), but the latter has generally fewer, smaller flowers and the lateral lobes have fewer, looser twists and lobed apices.

The ease with which the flowers of *T. venosa* open, and their propensity to stay open at night, are unusual for the genus.

2. *Thelymitra cyanea* (Lindl.) Benth., Fl. Austral. 6: 323 (1873).

Macdonaldia cyanea Lindl., *Edwards's Bot. Reg.* appendix to vols 1–23 [Sketch Veg. Swan R.]: 50 (1839–40). *Thelymitra venosa* R.Br. var. *cyanea* (Lindl.) Hatch, *Trans. & Proc. Roy. Soc. New Zealand* 79: 391 (1952). *Type:* Tasmania, Circular Head, xii.1837, *R. Gunn* 938 (lectotype specimen 12a K!, *fide* Clements 1989; isoelectotypes BMI, FII, K, PI, NSW!). *Syntypes:* Tasmania, Rocky Cape, xii.1837, *R. Gunn* 944 (K!).

Thelymitra uniflora Hook.f., *Fl. Antarct.* 1: 70 (1844). *Type:* Lord Auckland's Group; on the bare ground and growing in tufts of moss, *Forstera*, &c., on bleak hills, *J.D. Hooker s.n.* (holotype K).

Thelymitra venosa R.Br. var. *cedricsmithii* Hatch, *Trans. & Proc. Roy. Soc. New Zealand* 79: 390 (1952), *nom. nud.*

Thelymitra venosa R.Br. var. *typica* Hatch, *Trans. & Proc. Roy. Soc. New Zealand* 79: 390 (1952), *nom. illeg.*

Epiblema grandiflorum Buchanan, *Trans. & Proc. New Zealand Inst.* 14: 356 (1882), *non* R.Br. (1810).

Thelymitra venosa *auct., non* R.Br. (1810); T.F. Cheeseman, *Man. New Zealand Fl.* 343 (1925); J.H. Willis, *Handb. Pl. Victoria*, 1: 352 (1962); W.M. Curtis, *Stud. Fl. Tasmania* 4A: 48 (1979).

Illustrations: Nicholls (1969) plate 50, figs b–i. (as *Thelymitra venosa*); Jones (1988) page 294; Backhouse and Jeanes (1995) page 336; St George *et al.* (1996) page 104; St George (1999) page 139; Bishop (2000) plate 48; Jones (2006) page 250.

Glabrous terrestrial *herb.* *Tubers* ovoid, 1–3 cm long, 5–12 mm wide, fleshy. *Leaf* linear, 10–25(–37) cm long, 3–8 mm wide, erect, canaliculate, pale to dark green, ribbed abaxially, fleshy, sheathing at base, apex acute. *Scape* 15–55 cm tall, 1–2.5 mm diam., slender, wiry, pale green to purplish. *Sterile bracts* usually 2, rarely 1 or 3, linear-lanceolate, 18–55 mm long, 3–9 mm wide, closely sheathing, lower one often partially enclosed by leaf, acute to acuminate, green to purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 5–20 mm long, 3–7 mm wide, sheathing the pedicels, green or purplish. *Pedicels* 2–15 mm long, slender. *Ovary* cylindrical

to narrow-obovoid, 4–12 mm long, 2–4 mm wide. *Flowers* 1–4, 20–32 mm across, bright blue with darker blue longitudinal veins, particularly on dorsal sepal and petals, rarely white with blue veins or pink with brown veins, opening freely in warm weather. *Perianth segments* 8–16 mm long, 3.5–10 mm wide, thin textured, flat to slightly concave, often shortly apiculate; *dorsal sepal* ovate-lanceolate, obtuse or acute; *lateral sepals* lanceolate to oblanceolate, slightly asymmetric, more or less acute; *petals* ovate to obovate, obtuse or acute; *labellum* broadly obovate, broader than other perianth segments, distal margins often crisped, obtuse. *Column* erect from the end of ovary, 4–5.5 mm long, 2.5–3.5 mm wide, broadly winged, white to pale blue; *post-anther lobe* not hooding the anther, very short, covered with beady glands, cream; *auxiliary lobes* absent; *lateral lobes* more or less parallel, 1.5–2.5 mm long, 0.6–1 mm wide, fleshy, obliquely erect, often spirally twisted, yellow, base of inner margins with beady glands, apex often variously lobed. *Anther* inserted near apex of column, ovoid, 3–3.5 mm long, 1.8–2.7 mm wide, protruding forward at c. 90 deg. to column, white, dorsal surface minutely papillose, connective produced into a bifid beak c. 1 mm long (branches 0.3–0.6 mm long); *pollinarium* 2.2–2.5 mm long; *viscidium* more or less circular, c. 0.3 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated near base of column, transversely elliptic, 1.5–2 mm long, 1.8–2.5 mm wide, concave, margins irregular. *Capsules* obovoid, 10–15 mm long, 4–7 mm wide, erect, ribbed. (Fig. 1b; 4b).

Selected specimens examined: **SOUTH AUSTRALIA:** Lofty South District: near Mt Compass; Yundi Swamps, 26.xii.1979, M.A. Clements 1756 (CANB 8000468); Lofty South District: Square Water Hole Swamp, near Mt Compass, 9.xii.1967, R. Nosh s.n. (CANB 8104535); Southern Lofty District: Mt Compass, 15.xii.1907, R.S. Rogers 5157 (AD RSR5157); Mt Compass, 15.xii.1907, R.S. Rogers s.n. and Mrs Rogers (AD 97720251, AD 97518167, AD 97720249, AD 97720248, NSW 182871); Mt Compass, 15.xii.1907, Mrs R.S. Rogers s.n. (AD 96945202); Myponga, xii.1906, Mrs R.S. Rogers s.n. (NSW 182870); Myponga, 9.xii.1906, Mrs R.S. Rogers s.n. (AD 97720250A); Square Waterhole, 20.xii.1906, Mrs R.S. Rogers s.n. (AD 97720250B); Myponga, 19.xii.1906, R.S. Rogers 5156 and Mrs Rogers (AD 97720252); Myponga, Wittles Swamp, 23.xii.1906 (AD 97518168); Southern Lofty District: Peat bog behind 'Upson Downs' homestead, 23.i.1988, R.J. Botes 13860 (AD 98809064). **NEW SOUTH WALES:** Braidwood District, xii.1884, W. Bonerton

278 (MEL 114433); Barrington Tops, i.1926, H.M.R. Rupp s.n. (MEL 625279); Saxby's Swamp, Barrington, 7.i.1959, R. Filson 1418 (MEL 622704); Barrington Tops, xii.1925, H.M.R. Rupp s.n. (MEL 625605); North coast; Near Wauchope; 16 km W of Rollands Plains, top of the range, 9.xii.1979, M.A. Clements 1740 (CANB 7911529); Carrington Falls area, Jamberoo Hut, 11.xii.1960, E. ond L.J. Cody s.n. (CANB 64984); Mt Kosciusko, 22.i.1952, E. Goubo s.n. (CANB 14373); Happy Jacks Plains, Snowy Mountains (Boobee Hut), 17.i.1966, E.J. Corroll s.n. (CANB 17107); South coast: Northern Budawang Range, Camping Rock Creek, 5 of Sassafras, 20.xii.1972, J. Pulley s.n. and I. Telford (CANB 8307305); Braeside Walk (Blackheath end). Blue Mountains National Park, 21.xii.1990, A.D. Bishop J130/26-33 and J.F. Keller (NSW 274067). **AUSTRALIAN CAPITAL TERRITORY:** Mt Bimberi, SW of Canberra, 14.i.1970, J.H. Willis s.n. (MEL 114555); Brindabella Range, 1.5 km NE of Mt Ginini, Ginini Flats, 28.i.1977, M.D. Crisp 2464 and R. Nipperess (CANB 67174); Mt Murray, Bimberi Range, 52 km SW of Canberra, 2.ii.1977, H. Streimonn s.n. (CANB 67186); Brindabella Mountains, Snowy Flats, 5.1 km past locked gate at Mt Ginini, 3.iii.1993, C.H. Broers 354 and D.L. Jones (CANB 9306306); Snowy Flats, Bimbera Range, Cotter River District, 14.i.1968, L.G. Adams 2039 (CANB 172104); Mt Little Ginini, 10.i.1952, N.T. Burbidge 3682 (CANB 25880); Mt Gingera, 16.i.1954, M. Tindole s.n. (NSW 182855); Bimberi Peak, 15.i.1912, R.H. Comboge s.n. (NSW 182854). **VICTORIA:** Rocky Plains, 7 km S of Mt Cobberas No. 1, 26.i.1970, T.B. Muir 4821 (MEL 518808); Bogong High Plains. Near Middle Creek, upstream from Scout Hut, 19.i.1959, T.B. Muir 683 (MEL 114541); Carlisle State Park, 26 km SW of Colac P.O., 14.xii.1979, A.C. Beouglehole 67322 (MEL 1530889); Buckety Plain, c. 5 km ESE of Mt Cope, 12.i.1982, S.J. Forbes 763 (MEL 612726); Echo Flat, 8 miles ENE of Marysville, 3.ii.1963, T.B. Muir 2779 (MEL 114537); East Gippsland. Maramingo Creek, Genoa (Maramingo Swamp), 19.xii.1947, N.A. Wokefield 32B2 (MEL 1508390); Mustering Flat, Mt Baw Baw Plateau, ii.1980, N.G. Walsh 495 (MEL S96122); Mt Baw Baw, 24.i.1973, 8. Conn s.n. (MEL 625677); Carlisle River swamps, xii.1987, R.J. Botes 13003 (AD 98746532); Bidwell, i.1943, W. Hunter s.n. (NSW 182860). **TASMANIA:** Geeveston, i.1901, A.H.S. Lucos s.n. (NSW 190371); Longley, xii.1923, A.H.S. Lucos s.n. (NSW 190370); Flinders Island, Furneaux Group, Middle Patriarch area c. 1.2 km at 18 deg. NW of the South Patriarch summit, 22.xi.1978, J.S. Whinroy 2510 (MEL 602969); Port Davey, ii.1948, C. King s.n. (MEL 114440); Flinders Island, xi.1912, C.S. Sutton s.n. (MEL 2016027); Cradle Mountain, i.1914, R.S. Rogers s.n. (MEL 2016029); Foot of Mt Arrowsmith, 1.i.1915, R.A. Block s.n. (MEL 221586); Vicinity of Cradle Mountain, 10.v.1931, Weindorfer s.n. (MEL 114514); North of Triabunna, Bresnehan's property, 29.xii.1969, M.G. Corrick 2118 (MEL 674291); Between the Arve Rd and the Picton River bridge, 26.xii.1964, R. Filson 6983 (MEL 646260).

NEW ZEALAND: North Island: Waimarino, i.1921, *H.B. Matthews s.n.* (NSW 182877, NSW 182874, AD 97721005); North Island: Near Frankton Junction, Auckland District, 18.xii.1919, *H.B. Matthews s.n.* (AD 97721010); South Island: Invercargill, *T. Kirk 961* (AD 97605032); Tangiwai, 6.i.1945, *E.D. Hatch s.n.* (AD 97633356); North Island: Tangiwai, i.1945, *E.D. Hatch s.n.* (NSW 182878, AD 98615076); North Island: Near Ruapehu, i.1918, *H.B. Matthews s.n.* (AD 97721008); Hoe-te Lainui Road, Waikato, 6.xii.1958, *R. Mason and N.T. Moar 6770* (CANB 530997); Tangiwai, i.1945, *E.D. Hatch 410* (CANB 536423); South Island: W of Chasm Creek, Seddonville, West Coast, 19.i.1946, *H. Powell s.n.* (NSW 190503); Rukuhia, 1924, *H.B. Matthews s.n.* (NSW 182873); Stewart Island: Freshwater Landing, ii.1947, *C. Smith s.n.* (NSW 3958); Chatham Island, 11.xii.1909, *W.R.B. Oliver s.n.* (WELT 3764, WELT 7274); Stewart Island: Mason Plain, 29.xii.1959, *S. Natusch s.n.* (WELT 78182).

Distribution and habitat: South Australia, New South Wales, Australian Capital Territory, Victoria, Tasmania and New Zealand. Grows in moist sub-alpine herbfield, sphagnum bogs, in heathland along streams and in soaks, in perennially moist substrates such as sphagnum moss, peaty soils and sandy loams. Altitude: 10–1800 m. (Fig. 2b)

Conservation status: Widespread and reasonably common and well conserved throughout much of high altitude south-eastern Australia, but far less common at lower altitudes.

Flowering period: Mostly November to March.

Pollination biology: This species is facultatively autogamous.

Typification: The type sheet contains eight specimens, apparently of the same taxon, with three separate labels. The four specimens on the left (*R. Gunn 938*), collected at Circular Head in 1837, were selected by Clements (1989) as the lectotype. The group of two specimens in the centre (*R. Gunn s.n.*) and the group of two specimens on the right (*R. Gunn 944*), both collected at Rocky Cape in 1837, are syntypes. Two rudimentary line drawings in the lower left hand corner of the sheet, probably executed by Lindley, depict a column from the side and rear. The drawing on the left shows the anther beak to be bifid at the apex. Both drawings show the lateral lobes to be incurved (not twisted) and erose at the apex, features not typical of *T. cyanea* and likely to have contributed to later confusion between *T. cyanea* and *T. erosa*.

Notes: *Thelymitra cyanea* is closely related to *T. venosa* from central eastern New South Wales, but the latter is

a more robust species that can have as many as eight, generally larger, more freely opening flowers with longer lateral lobes on the column that have more, tighter twists.

3. *Thelymitra erosa* D.L.Jones and M.A.Clem., *Contr. Tasman. Orchid.*–8, (*Austral. Orchid Res.* 3) 184 (1998).

Type: Tasmania, Burwood Drive area, Blackmans Bay, 17.xi.1994, *J.E. Wapstra ORG57* and *A. Wapstra* (holotype CANB!; isotypes AD, HO, MEL2089287!, NSW).

Thelymitra cyanea auct., non (Lindl.) Benth.: L. Rodway. *Tasmanian Fl.*, 189 (1903); W.M. Curtis. *Student's Fl. Tasmania 4A*: 49 (1979).

Illustrations: Firth (1965) page 38, fig. 12 (as *T. cyanea*); Curtis (1979) fig. 5, E (as *T. cyanea*); Jones and Clements (1998) fig. 8.1, a, b and c; Jones *et al.* (1999) pages 260 and 270; Jones (2006) page 250.

Glabrous terrestrial herb. Tubers ovoid, 1–3 cm long, 5–13 mm wide, fleshy. Leaf linear to linear-lanceolate, 15–30 cm long, 4–10 mm wide, erect, canaliculate to conduplicate, fleshy to leathery, dark green with purplish base, ribbed abaxially, sheathing at base, apex acute. Scape 20–50 cm tall, 1.8–3.7 mm diam., slender to somewhat stout, straw-coloured to purplish. Sterile bracts usually 2, rarely 1 or 3, linear-lanceolate, 2.5–7 cm long, 5–11 mm wide, closely sheathing, acute to acuminate, green and purplish. Fertile bracts ovate-acuminate to obovate-acuminate, 7–23 mm long, 3–10 mm wide, sheathing the pedicel, green or purplish. Pedicels 2–24 mm long, slender. Ovary narrow-obovoid, 4–14 mm long, 2–4 mm wide. Flowers 1–8, (14–)18–30 (–40) mm across, mid-blue to pale purplish or pink with variable darker longitudinal striations, opening freely in warm weather. Perianth segments (6–)8–15(–19) mm long, 3–10 mm wide, concave, shortly apiculate; dorsal sepal ovate-lanceolate, acute to obtuse; lateral sepals ovate-lanceolate, asymmetric, acute to acuminate; petals ovate to ovate-lanceolate, acute to obtuse; labellum obovate to oblanceolate, often slightly broader than petals, acute to obtuse. Column erect from the end of ovary, 4.5–6.5 mm long, 2.5–4 mm wide, broadly winged, white or pale blue; post-anther lobe slightly hooding the anther, 1–2.5 mm long, 1.5–2.8 mm wide, reddish brown to almost black, often bilobed, margin



Figure 3. Distribution maps of: a. *Thelymitra erosa*; b. *Thelymitra alpicola* sp. nov.

irregular, sometimes with a central tooth, somewhat sinuate, dorsal surface rugulose, apex yellow or pinkish; *auxiliary lobes* absent; *lateral lobes* parallel or weakly incurved at the apices, 1–2.2 mm long, 0.5–1.1 mm wide, fleshy, obliquely erect or porrect, pink or brownish at base, faces smooth, margins deeply and irregularly erose, apex cream to yellow. *Anther* inserted towards apex of column, ovoid, 2.3–3.7 mm long, 1.5–2.5 mm wide, mostly green, connective produced into an entire or emarginate beak 0.5–1.3 mm long, rugulose; *pollinarium* 1.5–2.7 mm long; *viscidium* more or less circular, 0.3–0.5 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.7–2.5 mm wide, concave, margins irregular. *Capsules* obovoid, 10–18 mm long, 4–8 mm wide, erect, ribbed. (Fig. 1c; 4c)

Selected specimens examined: TASMANIA: Murdunna, Forestier Peninsula, 17.xii.1952, *R. Melville* 2454, *J. Willis*, *H. Barber* and *D. Paton* (MEL 518799); Near The Mount, xii.1985, *R.J. Fensham* s.n. (HO 314898); Roaring Meg Creek, near water supply reservoir, Queenstown, 7.xii.1977, *L.G. Adams* and *C.J. Adams* 3377 (HO 111818); Regatta Point, Strahan, 24.xi.1991, *P. Collier* 5330 (HO 411310); Surges Bay, 31.x.1992, *H.* and *A. Wapstra* s.n. (HO 500288); Blandfordia Spur, Sisters Hills, 30.xi.1984, *P. Collier* 69 (HO 115716); Bicheno, Mobil Service Station, 11.xi.1990, *D.L. Jones* 7149 and *C.H. Broers* (HO 326139); Timbertops Ridge, 7.xii.1983, *A.M. Buchanan* 1933 (HO 412165); Three Hummock Island. Edge of Telecom Airstrip, 7.xi.1999, *P. Tonelli* ORG2B37 (CANB 610977); East end of Rocky Cape National Park, near Sisters Beach boat ramp (Blackboy Hill), 31.x.1998, *D.L. Jones* 16027 and *M. Garratt* (CANB 605660).

Distribution and habitat: Apparently endemic to Tasmania where sometimes common in heathlands, woodlands and heathy, grassy or sedgy open forest. Soils are sandy or peaty loams. Often favours disturbed areas such as road sides and gravel pits. Altitude: 0–600 m. (Fig. 3a)

Conservation status: Widespread, often locally common and well conserved.

Flowering period: Late October to December.

Pollination biology: This species is facultatively autogamous. Most flowers usually have pollen grains on the stigma even before they open.

Notes: *Thelymitra erosa* shows considerable variation across its range, particularly in terms of the degree of venation of the perianth. Typical specimens have the perianth mid-blue to purplish or pink with variable darker purplish longitudinal striations. The lateral lobes of the column are more or less flat and parallel (or with the very tips slightly incurved), broad at the base and with deeply toothed to erose margins. *Thelymitra incurva* from far eastern Victoria and south-east New South Wales has a plain pale blue or pink perianth. The lateral lobes are often concave and strongly incurved throughout, broad at the base and with irregular but not deeply incised margins. *Thelymitra alpicola* from the margins of snow plains and montane heathlands in mainland south-eastern Australia has flowers that are deep purplish blue with very strong dark purplish longitudinal striations. The lateral lobes are more or less flat and parallel (apices sometimes incurved), often

narrow throughout and with irregularly erose but not deeply incised margins.

Thelymitra erosa has been confused with *T. cyanea* but the latter grows in wetter habitats, has a strongly differentiated labellum, the lateral lobes of the column are spirally twisted and lack erose margins and the anther beak is much more obviously bifid at the apex.

4. *Thelymitra alpicola* Jeanes sp. nov.

Type: Victoria. Snowfields Region: Rocky Plain, c. 20 km NW of Wulgulmerang, 23.xii.2000, *D. Rouse* JAJ986 (holotype MEL 2096100; isotypes MEL 2096101 spirit, CANB).

Thelymitra cyanea auct., non (Lindl.) Benth.: J.H. Willis. *Handb. Pl. Victoria*, 1: 352 (1962) p.p.; W.H. Nicholls. *Orchids of Australia*. 12 (1969) p.p.

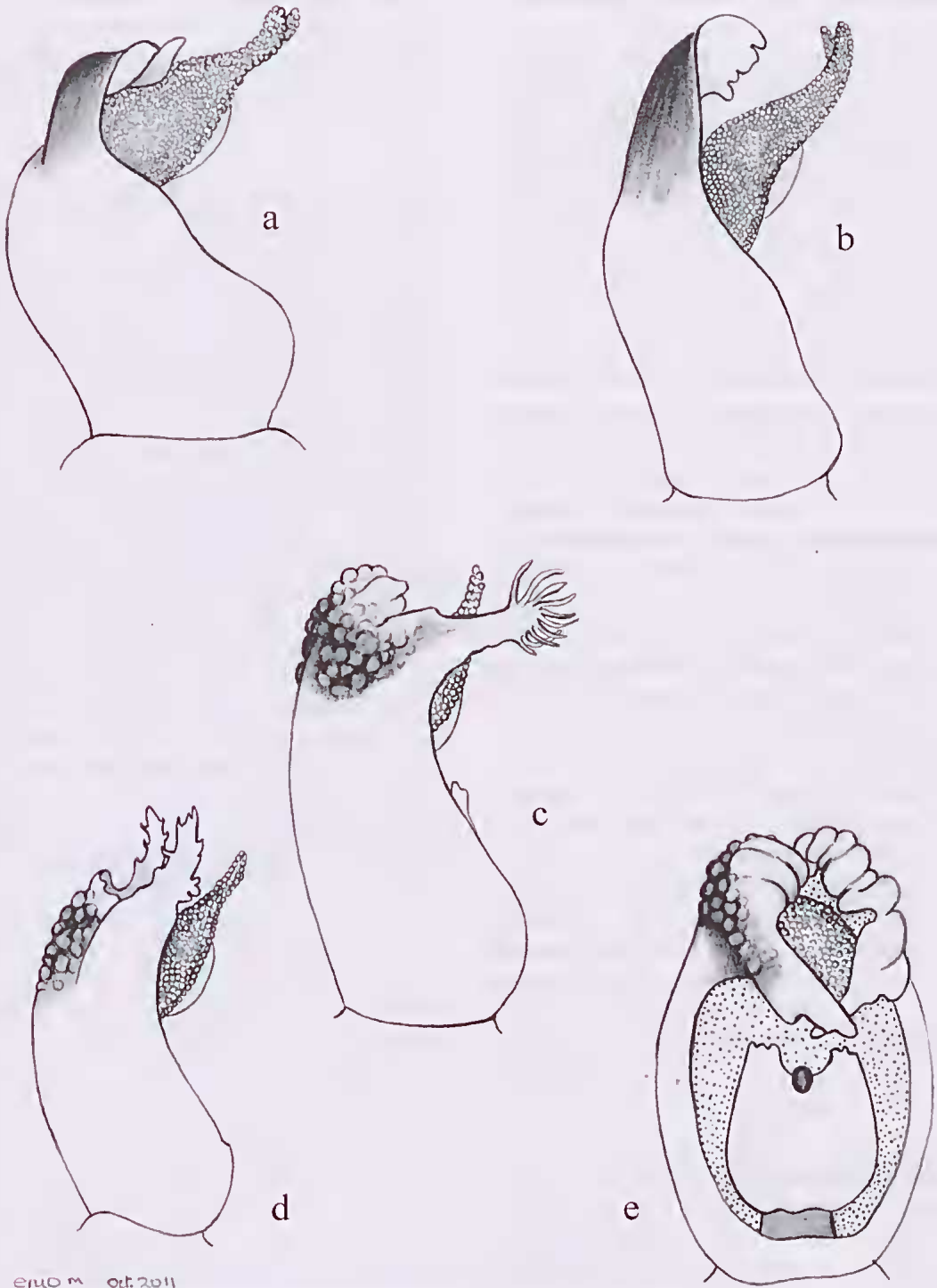
Thelymitra pulchella auct., non Hook.f.: M.A. Clements. *Catalogue of Australian Orchidaceae, Austral. Orchid Res.* 1, 142 (1989); J.Z. Weber and T.J. Entwisle in N.G. Walsh and T.J. Entwisle eds, *Flora of Victoria*, 2: 853 (1994); G.N. Backhouse and J.A. Jeanes. *The Orchids of Victoria*. 357 (1995).

Illustrations: Nicholls (1951) plate 50 (as *T. cyanea*); Nicholls (1969) plate 51 (as *T. cyanea*); Bernhardt (1993) page 151 (as *T. pulchella*); Weber and Entwisle (1994) fig. 179, o and p (as *T. pulchella*); Backhouse and Jeanes (1995) page 357 (as *T. pulchella*); Bishop (2000) plate 47; Jeanes and Backhouse (2000) page 161 (as *T. sp. aff. erosa*); Jeanes and Backhouse (2006) page 197 (as *T. erosa* ssp. 2); Jones (2006) page 249.

Glabrous terrestrial herb. *Tubers* ovoid, 1–3 cm long, 5–13 mm wide, fleshy. *Leaf* linear to linear-lanceolate, 6–25 cm long, 4–13 mm wide, erect, canaliculate to conduplicate, fleshy to leathery, dark green with purplish base, ribbed abaxially, sheathing at base, apex acute. *Scape* 15–50 cm tall, 1–3.7 mm diam., slender to somewhat stout, straw-coloured to purplish. *Sterile bracts* usually 2, rarely 1 or 3, linear-lanceolate, 1.5–8.5 cm long, 3–12 mm wide, closely sheathing, acute to acuminate, green and purplish. *Fertile bracts* ovate-acuminate to obovate-acuminate, 6.5–25 mm long, 3–10 mm wide, sheathing the pedicel, green or purplish. *Pedicels* 3–18 mm long, slender. *Ovary* narrow-obovoid, 5–13 mm long, 1.5–4 mm wide. *Flowers* 1–6, (15–)18–30(–34) mm across,

deep purplish blue with darker longitudinal striations, opening freely in warm weather. *Perianth segments* (7–)8–14(–16) mm long, 3–8 mm wide, concave, shortly apiculate; *dorsal sepal* ovate-lanceolate, acute to obtuse; *lateral sepals* ovate-lanceolate, asymmetric, acute to acuminate; *petals* ovate to ovate-lanceolate, acute to obtuse; *labellum* obovate to oblanceolate, often slightly broader than petals, acute to obtuse. *Column* erect from the end of ovary, 4.5–6.5 mm long, 2.5–3.7 mm wide, broadly winged, purplish; *post-anther lobe* slightly hooding the anther, 1–2.5 mm long, 1.5–2.5 mm wide, reddish brown to almost black, often bilobed, margin irregular, sometimes with a central tooth, somewhat sinuate, dorsal surface rugulose, apex yellow or pinkish; *auxiliary lobes* absent; *lateral lobes* parallel or weakly incurved at the apices, 1–2.2 mm long, 0.3–1.1 mm wide, fleshy, obliquely erect or porrect, pink or brownish at base, faces smooth, margins often shallowly and irregularly erose, apex cream to yellow. *Anther* inserted towards apex of column, ovoid, 2.3–3.7 mm long, 1.5–2.5 mm wide, mostly green, connective produced into an entire or emarginate beak 0.5–1.3 mm long, rugulose; *pollinarium* 1.5–2.7 mm long; *viscidium* more or less circular, 0.3–0.5 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.7–2.5 mm wide, concave, margins irregular. *Capsules* obovoid, 10–18 mm long, 4–8 mm wide, erect, ribbed. (Fig. 1d; 4d)

Selected specimens examined: NEW SOUTH WALES: Providence Portal turnoff on Snowy Mountains Highway, N side, 19.xii.1991, *A.D. Bishop* J182/21-28 (NSW 430475); Approx. 1.5 km E of Numeralla–Braidwood Road. N edge of Badja Swamps Nature Reserve, 16.xii.1991, *A.D. Bishop* J181/9-16 (NSW 430049); Southern Tablelands: 10 km W of Adaminaby, 23.xi.1981, *J. Taylor* 1392 (CANB 8200984); Southern Tablelands: c. 15 miles from Braidwood on road to Batemans Bay, 28.xii.1966, *R. Nash* s.n. (CANB 8109628); Badja, 6.i.1950, *E. Gauba* s.n. (CANB 14374); Clyde Mountain, top of pass on Batemans Bay–Braidwood Road, 28.xii.1966, *R. Nash* s.n. (CANB 176756); Southern Tablelands: Kosciusko National Park; Providence Portal turnoff on track to Kiandra from Adaminaby, 21.xii.1985, *M.A. Clements* 3929 (CANB 8585581); Boggy Creek Plains, xii.1987, *R.J. Bates* 13492 (AD RJB13492); Kanangra Boyd National Park. Kowmung River Trail, 9.xii.2000, *D. Rouse* and *J. Riley* JAJ823 (MEL 2172985); Oberon–Jenolan Caves Road, c. 0.7 km W of Goulburn turnoff and c. 3.7 km W of Kanangra Walls Road, 9.xii.2000, *D. Rouse* and *J. Riley* JAJ825 (MEL 2172973).



EMD M Oct. 2011

Figure 4. Illustrations of columns of: a. *Thelymitra venosa*; b. *Thelymitra cyanea*; c. *Thelymitra erosa*; d. *Thelymitra alpicola* sp. nov.; e. *Thelymitra incurva* sp. nov.

VICTORIA: Bidwell, 2.i.1943, *W. Hunter s.n.* (MEL 1532509, MEL 1532516, MEL 2098522); East Gippsland. Rocky Plain, 6.i.1971, A.C. Beaglehole 35889 and K.C. Rogers (MEL 652440); Bidwell Creek, i.1943, *W. Hunter s.n.* (NSW 415957); Bidwell, Bendoc, i.1943, *W. Hunter s.n.* (NSW 465642); Rocky Plain, c. 20 km NW of Wulgulmerang, 23.xii.2000, D. Rouse JAJ986 (MEL 2096100, MEL 2096101); Darlimurla near Mirboo North, Gippsland, 29.x.1999, J.A. Jeanes 635 (MEL 2173009); Darlimurla near Mirboo North, Gippsland, 8.xi.2000, J.A. Jeanes 938 (MEL 2172983); Long Flat, opposite the start of Forlorn Hope Track, 23.xii.2000, D. Rouse JAJ987 (MEL 2173007); Dingo Flat at Wombargo Saddle, c. 20 km NW of Wulgulmerang, 6.i.1991, J.A. Jeanes 715 (MEL 2173008).

Distribution and habitat: New South Wales and Victoria. Grows in alpine and montane heathlands, in moist areas around the edges of sphagnum bogs, beside streams or in soaks and swamps. A population in the Strzelecki Ranges Victoria is noteworthy for its disjunction and low altitude. Soils are generally dark sandy, clayey or peaty loams. Altitude: (200–)1000–1700 m. (Fig. 3b).

Conservation status: Widespread and sometimes locally common but overall vulnerable. Suggest 3VC by criteria of Briggs and Leigh (1996) and Vulnerable (VU) by criteria of IUCN (2011).

Flowering period: Late October to January.

Pollination biology: This species is facultatively autogamous. Most flowers usually have pollen grains on the stigma even before they open.

Notes: *Thelymitra alpicola* can be distinguished from *T. erosa* and *T. incurva* by its deep purplish blue, strongly striated perianth and more or less parallel (sometimes incurved at apices), often narrow, shallowly erose, lateral lobes on the column.

Etymology: Latin *alpinus*, of the alps; *cola*, dweller; in reference to the alpine or sub-alpine habitats where this species is most often found.

5. *Thelymitra incurva* Jeanes sp. nov.

Type: Victoria. East Gippsland Region: East Wingan Road c. 1.3 km from the Princes Highway, 11.xi.2004, J.A. Jeanes 1451 (holotype MEL 2265101; isotype MEL 2265104 spirit).

Thelymitra cyanea auct., non (Lindl.) Benth.: J.H. Willis. *Handb. Pl. Victoria*, 1: 352 (1962) p.p.; W.H. Nicholls. *Orchids of Australia*. 12 (1969) p.p.

Illustrations: Weber and Entwisle (1994) fig. 179, q (as *T. pulchella*); Backhouse and Jeanes (1995) page 358 (as *T. sp. aff. pulchella*); Jeanes and Backhouse (2000) page 161 (as *T. erosa*); Jeanes and Backhouse (2006) page 197 (as *T. erosa* ssp. 1); Jones (2006) page 250.

Glabrous terrestrial herb. Tubers ovoid, 1–3 cm long, 5–13 mm wide, fleshy. Leaf linear to linear-lanceolate, 10–20 cm long, 4–9 mm wide, erect, canaliculate to conduplicate, fleshy to leathery, dark green with purplish base, ribbed abaxially, sheathing at base, apex acute. Scape 20–65 cm tall, 1.2–3 mm diam., slender to somewhat stout, straw-coloured to purplish. Sterile bracts usually 2, rarely 1 or 3, linear-lanceolate, 2.5–10 cm long, 4–10 mm wide, closely sheathing, acute to acuminate, green and purplish. Fertile bracts ovate-acuminate to obovate-acuminate, 5–21 mm long, 3–7 mm wide, sheathing the pedicel, green or purplish. Pedicels 2–10 mm long, slender. Ovary narrow-obovoid, 5–10 mm long, 2–3.5 mm wide. Flowers 1–7, (15–)18–25 mm across, pale blue or rarely pink, lacking obvious darker longitudinal striations, opening freely in warm weather. Perianth segments (7–)8–12 mm long, 3–7 mm wide, concave, shortly apiculate; dorsal sepal ovate-lanceolate, acute to obtuse; lateral sepals ovate-lanceolate, asymmetric, acute to acuminate; petals ovate to ovate-lanceolate, acute to obtuse; labellum obovate to oblanceolate, often slightly broader than



Figure 5. Distribution map of *Thelymitra incurva* sp. nov.

petals, acute to obtuse. *Column* erect from the end of ovary, 4–5.5 mm long, 2.5–3.5 mm wide, broadly winged, pale blue; *post-anther lobe* slightly hooding the anther, 1.5–2 mm long, 1.5–2.2 mm wide, reddish brown to almost black, often bilobed, margin thickened, irregular, sometimes with a central tooth, somewhat sinuate, dorsal surface rugulose, apex yellow or pinkish; *auxiliary lobes* absent; *lateral lobes* usually strongly incurved throughout, 1.5–2 mm long, 0.5–1 mm wide, fleshy, often concave, obliquely erect or porrect, pink or brownish at base, faces smooth, margins often shallowly and irregularly erose, apices often touching below tip of anther beak, cream to yellow. *Anther* inserted towards apex of column, ovoid, 2.3–3.7 mm long, 1.5–2.5 mm wide, mostly green, connective produced into an entire or emarginate beak 0.5–1.3 mm long, rugulose; *pollinarium* 1.5–2.7 mm long; *viscidium* more or less circular, 0.3–0.5 mm diam.; *pollinia* white, friable, mealy. *Stigma* situated at base of column, ovate-quadrate, 1.5–2.5 mm long, 1.7–2.5 mm wide, concave, margins irregular. *Capsules* obovoid, 10–18 mm long, 4–8 mm wide, erect, ribbed. (Fig. 1e; 4e)

Specimens examined: **NEW SOUTH WALES:** Nadgee Nature Reserve, 9.xi.2004, J.A. Jeones 1446 (MEL 2265087, MEL 2265088). **VICTORIA:** East Gippsland Region. Beside East Wigan Rd, c. 600 m SE of the Princes Highway and c. 27 km E of Cann River township, 15.xi.1991, J.A. Jeones 4 (MEL 2011685); East Gippsland c. 5.5 miles direct NE of Mallacoota P.O. c. 2 miles S of Marshmead property on track to Lake View, 8.xi.1969, A.C. Beoughole 31579 and J.H. Willis (MEL 114553); East Wigan Road, W of Genoa, 17.xi.1992, A.D. Bishop J245/13-17 (NSW 430839); Far East Gippsland, 2 miles S of Marshmead, E of Mallacoota National Park, x.1969, J.H. Willis s.n. and A.C. Beoughole (MEL 2039740); East Gippsland Region: Genoa. Grasstree plains near intersection of Princes Hwy and East Wigan Rd., 15.xi.1991, J.A. Jeones s.n. (MEL 2046931); East Gippsland Region. Beside East Wigan Rd, c. 600 m SE of the Princes Highway and c. 27 km E of Cann River township, 15.xi.1991, J.A. Jeones 337 (MEL 2172979).

Distribution and habitat: Far eastern Victoria and south-eastern New South Wales. Grows in heathlands and heathy woodlands mostly around the edges of grasstree (*Xanthorrhoea resinosa*) plains, often in disturbed sites such as roadsides and gravel scrapes. Soils are moist coarse sandy, peaty loams. Altitude: 40–100 m. (Fig. 5)

Conservation status: Currently known from about six sites with very few plants and probably endangered. Suggest 2EC by criteria of Briggs and Leigh (1996) and Endangered (EN) by criteria of IUCN (2011).

Flowering period: Late October to early December.

Pollination biology: This species is facultatively autogamous. Most flowers usually have pollen grains on the stigma even before they open.

Notes: *Thelymitra incurva* can be distinguished from *T. erosa* and *T. alpicola* by its plain, pale blue (rarely pink) flowers and strongly incurved, broad, often concave, shallowly erose lateral lobes on the column.

Etymology: Latin *incurvus*, curved, crooked; a reference to the lateral lobes of the column that are usually strongly incurved throughout.

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